

REMARKS/ARGUMENTS

Request for Continued Examination:

The applicant respectfully requests continued examination of the above-indicated
5 application as per 37 CFR 1.114.

The Examiner is thanked for the thorough examination and search of the subject.

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Claims 163-208 are pending; Claims 163-199, 201, 203, 205, 207 and 208 have been currently amended; Claims 1-162 have been canceled. No new matter is believed to be added.

15 **Response to Claim Rejections under 35 U.S.C. 103**

Applicants respectfully traverse the rejections for at least the reasons set forth below.

20 **Response to Claims 163-178**

As currently amended, independent claim 163 is recited below:

163. A chip package comprising:

25 a silicon substrate;
 a die;
 an adhesive material joining a backside of said die to said silicon substrate;
 a first polymer layer on said silicon substrate, wherein said die is in a
30 first opening in said first polymer layer;

a second first polymer layer on a front side of said die and on said first polymer layer;

5 a first patterned metal layer on said second polymer layer and over said front side of said die and over said first polymer layer, wherein said first patterned metal layer is connected to said die through a second opening in said second polymer layer, and wherein said first patterned metal layer comprises electroplated copper;

10 a third polymer layer over said first patterned metal layer, over said second polymer layer, over said front side of said die and over said first polymer layer;

15 a second patterned metal layer on said third polymer layer, over said front side of said die and over said first polymer layer, wherein said second patterned metal layer is connected to said first patterned metal layer through a third opening in said third polymer layer, and wherein said second patterned metal layer comprises electroplated copper;

an insulating layer on said second patterned metal layer, on said third polymer layer, over said front side of said die and over said first polymer layer, wherein a fourth opening in said insulating layer is over a pad of said second patterned metal layer and exposes said pad; and

20 a solder bump over said pad and directly over said first polymer layer, wherein said solder bump is connected to said pad through said fourth opening.

25 *Reconsiderations of Claims 163-178 rejected under 35 U.S.C. 103(a) as being unpatentable over Eichelberger et al. (U.S. Pat. No. 6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124) are requested based on the following remarks.*

30 Applicants respectfully assert that the chip package currently claimed in Claim 163 patentably distinguishes over the citations by Eichelberger et al. (U.S. Pat. No.

6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124).

The Examiner considers that “Wagner suggests a silicon substrate for thermal expansion matching and superior heat conductivity (columns 3 and 4)”. ~ *See lines 12-14, on page 2, in the last Office Action mailed Jan. 4, 2008* ~ However, even though a silicon substrate has the advantages as above-mentioned by the Examiner, the Examiner fails to explain why those skilled in the art could apply Wagner et al.’s silicon substrate 10 to Eichelberger et al.’s substrate 101.

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Wagner et al. teaches a die 38 is joined with a silicon substrate 10 after metal trace and pad 120 and 130 are formed. ~ *See Figs. 16 and 17* ~ However, Wagner et al. fail to teach, hint or suggest that there may be a patterned metal layer and a polymer layer formed over a die 38 having been joined with a silicon substrate 10. 15 Wagner et al.’s method goes against the purpose of Eichelberger et al.’s teaching of forming a patterned metal layer 109 and a polymer layer 106 over a die 102 having been joined with a substrate 101, as shown in Figs. 3A-3G. As a result, it is believed that the silicon substrate 10 of Wagner et al.’s device is non-analogous to the substrate 101 of Eichelberger et al.’s device.

20

The Examiner considers that “Wachtler suggests polymer or adhesive on side surfaces as well as the top or bottom surface of the die in a cavity to secure and insulate the die (columns 8 and 9 and figure 22). Note the disclosed polymer of Wachtler is also “adhesive” and adhesives here obviously can be polymers.” ~ *See lines 14-17, on page 2, in the last Office Action mailed Jan. 4, 2008* ~ However, even though Wachtler et al. teach that a polymer layer 24 can be on side and top surfaces of a die 16, as shown in Fig. 22, the Examiner fails to explain why those skilled in the art could apply Wagner et al.’s polymer layer 24 to Eichelberger et al.’s filler 104, as shown in Fig. 3A.

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Wachtler et al.'s substrate 12 has a shape significantly different from that of Eichelberger et al.'s substrate 101. Wachtler et al. teaches that a cavity is in a substrate 12, accommodating a die 16. ~ See Fig. 22 ~ Eichelberger et al. teaches no cavity is in a substrate 101. ~ See Fig. 2 ~ The considerations of filling a gap 5 between the die 16 and sidewall of the cavity in the substrate 12, as shown in Fig. 10 in Wachtler et al.'s reference, are significantly different from those of forming a filler 104 over the flat substrate 104. As a result, it is believed that Wachtler et al.'s polymer layer 24 is non-analogous to Eichelberger et al.'s filler 104.

10 Furthermore, all of Eichelberger et al., Wagner et al. and Wachtler et al. fail to teach, hint or suggest that the claimed subject matter that a solder bump is directly over a polymer layer, with a die being in an opening in the polymer layer and multiple patterned metal layers being over the die, as currently claimed in Claim 163.

15 The Examiner considers that “arguments regarding electroplated metal are unconvincing of patentability as, contrary to the arguments on page 12 of the remarks of the remarks, there are no recitations in the claims of any particular “microstructure” or “grain size” or “crystal orientation” to structurally distinguish the claims over the applied art”. ~ See lines 8-11 in page 4, in the last Office Action mailed Jan. 4, 2008

20 ~

Applicants respectfully traverse the Examiner's request to recite an exact “microstructure”, “grain size” or “crystal orientation” for imparting an electroplated metal from other metals. In the following extraction from M.P.E.P., applicants have 25 no responsibility to recite an exact “microstructure”, “grain size” or “crystal orientation” for imparting electroplated copper from other metals.

The structure implied by the process steps should be considered when 30 assessing the patentability of product-by-process claims over the prior art, especially

where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., In re Garnero, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by 5 interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations.) ~ *Extracted from MPEP 2113 ~*

10 Even though applicants have no responsibility to recite an exact "microstructure", "grain size" or "crystal orientation" for imparting electroplated copper from other metals, applicants provide a way to identify electroplated copper. Electroplated copper can be expected to impart distinctive structural characteristics to the final product in the grain size using a TEM cross-section or in the crystal 15 orientation using a TEM cross-section or an X-ray diffraction analysis. Under the rule on MPEP 2113, it is believed that the structure of electroplated metal implied by a process step should be considered.

For at least the foregoing reasons, withdrawal of rejection under 35 U.S.C.
20 103(a) to Claims 163-178 is respectfully requested.

Applicants respectfully submit independent Claim 163 patently distinguishes over the prior art references, and should be allowed. For at least the same reasons, dependent Claims 164-178 patently define over the prior art as well.

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Response to Claims 179-196

As currently amended, independent Claim 179 is recited below:
30 179. A chip package comprising:

a silicon substrate;
a die;
an adhesive material joining a backside of said die to said silicon substrate;

5 a first polymer layer on said silicon substrate, wherein said die is in a first opening in said first polymer layer;

 a second polymer layer on a front side of said die and on said first polymer layer, wherein a second opening in said second polymer layer is over a first pad of said die and exposes said first pad, and a third opening in said 10 second polymer layer is over a second pad of said die and exposes said second pad; and

 a patterned metal layer on said second polymer layer, over said front side of said die and over said first polymer layer, wherein said patterned metal layer comprises electroplated copper, wherein said patterned metal layer is connected to said first and second pads through said second and third openings, and wherein said first pad is connected to said second pad through said patterned 15 metal layer.

20 *Reconsiderations of Claims 179-196 rejected under 35 U.S.C. 103(a) as being unpatentable over Eichelberger et al. (U.S. Pat. No. 6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124) are requested based on the following remarks.*

25 Applicants respectfully assert that the chip package currently claimed in Claim 179 patentably distinguishes over the citations by Eichelberger et al. (U.S. Pat. No. 6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124).

30 The Examiner considers that “Wagner suggests a silicon substrate for thermal

expansion matching and superior heat conductivity (columns 3 and 4)”. ~ *See lines 12-14, on page 2, in the last Office Action mailed Jan. 4, 2008* ~ However, even though a silicon substrate has the advantages as above-mentioned by the Examiner, the Examiner fails to explain why those skilled in the art could apply Wagner et al.’s 5 silicon substrate 10 to Eichelberger et al.’s substrate 101.

Wagner et al. teaches a die 38 is joined with a silicon substrate 10 after metal trace and pad 120 and 130 are formed. ~ *See Figs. 16 and 17* ~ However, Wagner et al. fail to teach, hint or suggest that there may be a patterned metal layer and a 10 polymer layer formed over a die 38 having been joined with a silicon substrate 10. Wagner et al.’s method goes against the purpose of Eichelberger et al.’s teaching of forming a patterned metal layer 109 and a polymer layer 106 over a die 102 having been joined with a substrate 101, as shown in Figs. 3A-3G. As a result, it is believed that the silicon substrate 10 of Wagner et al.’s device is non-analogous to the substrate 15 101 of Eichelberger et al.’s device.

The Examiner considers that “Wachtler suggests polymer or adhesive on side surfaces as well as the top or bottom surface of the die in a cavity to secure and insulate the die (columns 8 and 9 and figure 22). Note the disclosed polymer of 20 Wachtler is also “adhesive” and adhesives here obviously can be polymers.” ~ *See lines 14-17, on page 2, in the last Office Action mailed Jan. 4, 2008* ~ However, even though Wachtler et al. teach that a polymer layer 24 can be on side and top surfaces of a die 16, as shown in Fig. 22, the Examiner fails to explain why those skilled in the art could apply Wagner et al.’s polymer layer 24 to Eichelberger et al.’s filler 104, as 25 shown in Fig. 3A.

Wachtler et al.’s substrate 12 has a shape significantly different from that of Eichelberger et al.’s substrate 101. Wachtler et al. teaches that a cavity is in a substrate 12, accommodating a die 16. ~ *See Fig. 22* ~ Eichelberger et al. teaches 30 no cavity is in a substrate 101. ~ *See Fig. 2* ~ The considerations of filling a gap

between the die 16 and sidewall of the cavity in the substrate 12, as shown in Fig. 10 in Wachtler et al.'s reference, are significantly different from those of forming a filler 104 over the flat substrate 104. As a result, it is believed that Wachtler et al.'s polymer layer 24 is non-analogous to Eichelberger et al.'s filler 104.

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Furthermore, all of Eichelberger et al., Wagner et al. and Wachtler et al. fail to teach, hint or suggest that the claimed subject matter that a first pad of a die is connected to a second pad of the die through a patterned metal layer on a second polymer layer on the die and on a first polymer layer, with the die being in an opening 10 in the first polymer layer, as currently claimed in Claim 179.

The Examiner considers that "arguments regarding electroplated metal are unconvincing of patentability as, contrary to the arguments on page 12 of the remarks of the remarks, there are no recitations in the claims of any particular "microstructure" 15 or "grain size" or "crystal orientation" to structurally distinguish the claims over the applied art". ~ *See lines 8-11 in page 4, in the last Office Action mailed Jan. 4, 2008*
~

Applicants respectfully traverse the Examiner's request to recite an exact 20 "microstructure", "grain size" or "crystal orientation" for imparting an electroplated metal from other metals. In the following extraction from M.P.E.P., applicants have no responsibility to recite an exact "microstructure", "grain size" or "crystal orientation" for imparting electroplated copper from other metals.

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The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart 30 distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412

F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations.) ~ *Extracted from MPEP 2113* ~

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Even though applicants have no responsibility to recite an exact "microstructure", "grain size" or "crystal orientation" for imparting electroplated copper from other metals, applicants provide a way to identify electroplated copper.

10 Electroplated copper can be expected to impart distinctive structural characteristics to the final product in the grain size using a TEM cross-section or in the crystal orientation using a TEM cross-section or an X-ray diffraction analysis. Under the rule on MPEP 2113, it is believed that the structure of electroplated metal implied by a process step should be considered.

15

For at least the foregoing reasons, withdrawal of rejection under 35 U.S.C. 103(a) to Claims 179-196 is respectfully requested.

20 Applicants respectfully submit independent Claim 179 patently distinguishes over the prior art references, and should be allowed. For at least the same reasons, dependent Claims 180-196 patently define over the prior art as well.

Response to Claims 197-208

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As currently amended, independent Claim 197 is recited below:

197. A chip package comprising:

a substrate;

a die;

30 an adhesive material joining a backside of said die to said substrate;

a first polymer layer on said substrate, wherein said die is in a first opening in said first polymer layer;

5 a second polymer layer on a front side of said die and on said first polymer layer, wherein a second opening in said second polymer layer is over a first pad of said die and exposes said first pad, and a third opening in said second polymer layer is over a second pad of said die and exposes said second pad; and

10 a patterned metal layer on said second polymer layer, over said front side of said die and over said first polymer layer, wherein said patterned metal layer comprises electroplated copper, and wherein said patterned metal layer comprises a ground bus connecting said first and second pads through said second and third openings.

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15 *Reconsiderations of Claims 197-208 rejected under 35 U.S.C. 103(a) as being unpatentable over Eichelberger et al. (U.S. Pat. No. 6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124) are requested based on the following remarks.*

20 Applicants respectfully assert that the chip package currently claimed in Claim 197 patentably distinguishes over the citations by Eichelberger et al. (U.S. Pat. No. 6,396,148) in view of Wagner et al. (U.S. Pat. No. 5,196,377) and Wachtler et al. (U.S. Pat. No. 6,707,124).

25 The Examiner considers that “Wachtler suggests polymer or adhesive on side surfaces as well as the top or bottom surface of the die in a cavity to secure and insulate the die (columns 8 and 9 and figure 22). Note the disclosed polymer of Wachtler is also “adhesive” and adhesives here obviously can be polymers.” ~ See lines 14-17, on page 2, in the last Office Action mailed Jan. 4, 2008 ~ However, even
30 though Wachtler et al. teach that a polymer layer 24 can be on side and top surfaces of

a die 16, as shown in Fig. 22, the Examiner fails to explain why those skilled in the art could apply Wagner et al.'s polymer layer 24 to Eichelberger et al.'s filler 104, as shown in Fig. 3A.

5 Wachtler et al.'s substrate 12 has a shape significantly different from that of Eichelberger et al.'s substrate 101. Wachtler et al. teaches that a cavity is in a substrate 12, accommodating a die 16. ~ See Fig. 22 ~ Eichelberger et al. teaches no cavity is in a substrate 101. ~ See Fig. 2 ~ The considerations of filling a gap between the die 16 and sidewall of the cavity in the substrate 12, as shown in Fig. 10
10 in Wachtler et al.'s reference, are significantly different from those of forming a filler 104 over the flat substrate 104. As a result, it is believed that Wachtler et al.'s polymer layer 24 is non-analogous to Eichelberger et al.'s filler 104.

15 Furthermore, all of Eichelberger et al., Wagner et al. and Wachtler et al. fail to teach, hint or suggest that the claimed subject matter that a first pad of a die is connected to a second pad of the die through a ground bus of a patterned metal layer on a second polymer layer on the die and on a first polymer layer, with the die being in an opening in the first polymer layer, as currently claimed in Claim 197.

20 The Examiner considers that "arguments regarding electroplated metal are unconvincing of patentability as, contrary to the arguments on page 12 of the remarks of the remarks, there are no recitations in the claims of any particular "microstructure" or "grain size" or "crystal orientation" to structurally distinguish the claims over the applied art". ~ See lines 8-11 in page 4, in the last Office Action mailed Jan. 4, 2008
25 ~

30 Applicants respectfully traverse the Examiner's request to recite an exact "microstructure", "grain size" or "crystal orientation" for imparting an electroplated metal from other metals. In the following extraction from M.P.E.P., applicants have no responsibility to recite an exact "microstructure", "grain size" or "crystal

orientation” for imparting electroplated copper from other metals.

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The structure implied by the process steps should be considered when
5 assessing the patentability of product-by-process claims over the prior art, especially
where the product can only be defined by the process steps by which the product is
made, or where the manufacturing process steps would be expected to impart
distinctive structural characteristics to the final product. See, e.g., In re Garnero, 412
F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by
10 interfusion" to limit structure of the claimed composite and noting that terms such as
"welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of
construction as structural limitations.) ~*Extracted from MPEP 2113* ~

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15 Even though applicants have no responsibility to recite an exact
“microstructure”, “grain size” or “crystal orientation” for imparting electroplated
copper from other metals, applicants provide a way to identify electroplated copper.
Electroplated copper can be expected to impart distinctive structural characteristics to
the final product in the grain size using a TEM cross-section or in the crystal
20 orientation using a TEM cross-section or an X-ray diffraction analysis. Under the
rule on MPEP 2113, it is believed that the structure of electroplated metal implied by a
process step should be considered.

The Examiner considers that “Regarding a “ground bus” note the metallization
25 connecting pads in the prior art can function or be labeled as a “ground bus”. See In
re Swinehart 169 USPQ 226, Ex parte Minks 169 USPQ 120 and In re Pearson 181
USPQ 641 where it was decided that functional language, statements of intended use,
or mere labels do not structurally distinguish claims over anticipating prior art”. ~
See lines 13-17 on page 4, in the last Office Action mailed Jan. 4, 2008 ~

Applicants respectfully traverse the Examiner's opinion because a functional limitation must be evaluated and considered, just like any other limitation of the claim, as mentioned in the following paragraph.

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A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step. >In Innova/Pure Water Inc. v. Safari Water Filtration Sys. Inc., 381 F.3d 1111, 1117-20, 72 USPQ2d 1001, 1006-08 (Fed. Cir. 2004), the court noted that the claim term "operatively connected" is "a general descriptive claim term frequently used in patent drafting to reflect a functional relationship between claimed components," that is, the term "means the claimed components must be connected in a way to perform a designated function." "In the absence of modifiers, general descriptive terms are typically construed as having their full meaning." Id. at 1118, 72 USPQ2d at 1006. In the patent claim at issue, "subject to any clear and unmistakable disavowal of claim scope, the term 'operatively connected' takes the full breath of its ordinary meaning, i.e., 'said tube [is] operatively connected to said cap' when the tube and cap are arranged in a manner capable of performing the function of filtering." Id. at 1120, 72 USPQ2d at 1008.< ~Extracted from MPEP 2173.05(g)~

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25 In M.P.E.P. 2173.05(g), it is believed that a functional limitation, such as ground bus, must be evaluated and considered, just like any other limitation of the claim.

For at least the foregoing reasons, withdrawal of rejection under 35 U.S.C. 103(a) to Claims 197-208 is respectfully requested.

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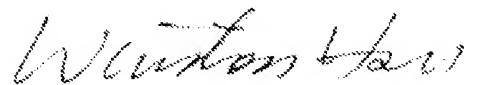
Applicants respectfully submit independent Claim 197 patentably distinguishes over the prior art references, and should be allowed. For at least the same reasons, dependent Claims 198-208 patentably define over the prior art as well.

5 CONCLUSION

Some or all of the pending claims are believed to be in condition for allowance. Accordingly, allowance of the claims and the application as a whole are respectfully requested.

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Sincerely yours,



Date: 04/03/2008

15 Winston Hsu, Patent Agent No. 41,526

P.O. BOX 506, Merrifield, VA 22116, U.S.A.

Voice Mail: 302-729-1562

Facsimile: 806-498-6673

e-mail : winstonhsu@naipo.com

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Note: Please leave a message in my voice mail if you need to talk to me. (The time in D.C. is 12 hours behind the Taiwan time, i.e. 9 AM in D.C. = 9 PM in Taiwan.)